

## Properties of Soil Particles Visual Activity

Level: Middle/High School Level

Time: 30 minutes with discussion

### Materials:

Construction Paper

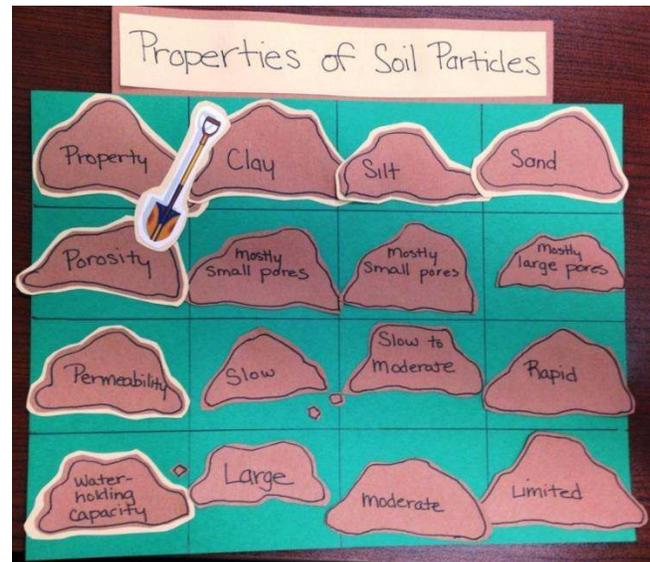
Ruler

Glue

Scissors

Pen

If possible, samples of clay, silt, and sand



### Procedure:

1. Students should draw a 4 X 4 square table on one sheet of construction paper with a ruler.
2. Students label the top of the table with the following words: Property, Clay, Silt, and Sand. Then label the left row with Porosity, Permeability, and Water-Holding Capacity.
3. Students should then examine the clay, silt, and sand samples, if available, and discuss their observations for each property. Question: What is the clay sample's permeability? Answer: The clay sample seems to have a slow permeability; water moves slowly through the clay. Question: What did you observe with the sand sample's water-holding capacity? Answer: Sand has very limited water-holding capacity. It does not seem to retain very much moisture at all.
4. Students should complete the table descriptors of each category.

| Property               | Clay               | Silt               | Sand               |
|------------------------|--------------------|--------------------|--------------------|
| Porosity               | Mostly small pores | Mostly small pores | Mostly large pores |
| Permeability           | Slow               | Slow to moderate   | Rapid              |
| Water-holding capacity | Large              | Moderate           | Limited            |

**Background information:** Different types of soil, like silt, loam, and clay, have different properties that make it unique. Generally, we do not think much about the soil. Sometimes, soil even has a negative connotation when we call it dirt and wash it off our clothes and our bodies. In reality, soil is essential to our survival and that of nearly every organism on Earth. Our planet is mostly made of rock with an iron-nickel core. Plants and animals, including us, occupy a thin veneer on its surface. Our existence is possible because of the thin layer of soil that lies between the planet's rocky interior and the surface.

The weathering of rock slowly produces soils. Constant exposure to wind and rain cause the rocky crust to break down slowly into smaller particles. The process can take centuries to

produce fertile topsoil. As rainwater seeps into cracks in the rock, temperature extremes cause the water to freeze and later melt. The rock expands, contracts, and fractures. These weathering actions are helped along by organisms that live on and in the soil. Soils are composed of both inorganic material derived from rock and organic material derived from living and dead organisms. Both are important to support plant growth. Some scientists believe that without life, soils are just dirt.

The relative amounts of clay, silt, and sand present determines the ability of a soil to accept and retain water. Porosity refers to spaces in the soil that can hold either air or water. Scientists define permeability as the rate at which water can travel through soil. Table 8 lists properties of particle size that relate to soils' interactions with water. Scientists call soils with desirable properties for farming 'loams.' Loamy soils typically contain about 50 percent air space, which allows root systems to "breathe" (i.e. obtain O<sub>2</sub> for respiration). The solid half of soils is about 90 percent minerals and 10 percent organic material. Usually, loamy soils have names that more accurately reflect their composition, such as clay loam or silt loam.